

Firm Productivity in the Western Balkans: The Impact of European Union Membership and Access to Finance

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ABSTRACT

This study examines the productivity performance of Balkan firms within and outside the European Union (EU) including the influence of loans. A multiple treatment model is used to compare the effects on productivity of membership and loans, both separately and collectively, which in the case of loans allows a separate analysis of their influence on firms in non-member states. The use of conditional quantile regressions measures the effect on productivity of membership and loans separately as treatment variables. This provides an analysis of where the treatment influence is greatest across the distribution curve and identifies the significance of selected control variables on the outcome. Within the full sample, the findings indicate that EU membership and loans have a positive effect on productivity; membership being more important than loans. Outside the EU, firms in receipt of loans are more productive than those without. However, the significance of both membership and loans is restricted to the lower end of the productivity distribution curve. The manufacturing sample shows that EU membership has a significant positive effect across 70% of the deciles measured, whilst the influence of loans is restricted to the lower deciles, with rental capital (leasing) also positively significant in the lower four deciles. In the services sector however, membership is significant up to 90% of the distribution, with loans at 60%.

Key Words: Transition economies; Firm productivity, EU membership; Access to loans; Multi-level model, Quantile regression
JEL Classification C21, D24, F19, O16

INTRODUCTION¹

The purpose of this study is to evaluate the influence of EU membership and access to finance on the productivity of firms in the Western Balkans. It analyses the productivity performance of EU firms against those within the accession process and identifies whether there is a relevance to a strong institutional and regulatory framework. It also confirms findings in the literature (see Levine, 2005; Volz, 2010) that loans contribute to improved productivity and, by disaggregating the full sample, it identifies these influences across specific business sectors and examines the impact of EU membership and loans across the productivity distribution curve identifying areas of maximum influence across both full and disaggregated samples.

The expansion of the EU from 15 to 27 states in the period 2004-2013 is claimed to have led to significant economic and geopolitical benefits to the new member states (NMS) of Bulgaria, Croatia and Slovenia. However, Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro and Serbia, in the pre-accession process, bring into question whether enlargement fatigue will prevent these countries ever achieving membership. In the 1990s, ethnic wars caused hardship and significant disruption to societal and institutional development, issues which must be addressed before accession can be considered (Vachudova, 2014). “Since the early 2000’s the EU has emerged as the primary actor in state building in the Western Balkans. Based on a dual strategy of state building and European integration, the EU has sought to replace other international organisations in the post-conflict reconstruction of the Western Balkans” (Bieber, 2011, p.1783).

This study explores, at the firm level, the impact of EU membership and access to loans on firm productivity in the Balkan countries of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Serbia and Slovenia. It compares the levels of output per worker in EU member countries in contrast to those outside and uses capital, cost per worker, skill level, foreign ownership, size, age, bureaucracy and competition as control variables. Bulgaria, Croatia and Slovenia are already EU member states and Albania, Bosnia and Herzegovina, Kosovo, Macedonia and Serbia are theoretically part of the pre-accession process.

Significant literature exists on the macroeconomic relationship between the EU and the Balkans (see Bieber, 2011; Bechev, 2012; Petrovic and Smith, 2013; Prokopijević and Tasić, 2015). This study extends the debate and explores whether, at firm level, there are productivity opportunities to be gained through EU membership. New trade theory states that firms become more productive as a result of increasing economies of scale and network effects (Krugman, 1979). The EU is

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a customs union of 27 countries, which facilitates the development of these attributes and provides a platform to encourage foreign direct investment and exports, the key drivers of improved productivity.

Additionally, there is evidence that access to finance is a constraint on firm level growth in non-EU member countries whereas, with respect to leverage, there is convergence within the EU. Thus, it would appear that within the EU, as a result of improved financial intermediation, access to finance improves, while outside the EU, credit constraint continues to be a problem, however correlation should not imply causality. (EBRD, 2016).

Until recently, the contribution of finance to economic growth and development was not fully recognised in economic literature, although there is now a strong theoretical foundation for the argument that finance can provide a stimulus to productivity (Levine, 2005). This has been increasingly supported by empirical research, some of which specifically relates to transitional countries (Volz, 2010). However, there have been few firm- level studies on the impact of EU membership and finance on firm performance in the Balkan region and this paper also provides a contribution to this under-researched area (Shimbov et al 2016, Botric 2013 and Berman and Hericot 2010). The study focuses on all firms, including a disaggregated analysis of services and manufacturing. Enhancing productivity is of greater consequence in developing economies than in the developed world because improvements within a national cohort of heterogeneous firms results in the evolution of a more effective industrial base (Roberts and Tybout, 1996)

The remainder of the paper is organised as follows. Section 2 of this paper provides a review of the relevant theoretical and empirical literature. Section 3 outlines data and methodology and Section 4 the empirical results. Section 5 concludes.

1. LITERATURE REVIEW

The Western Balkans are increasing their participation in international production networks (IPN) where fragmentation of the manufacturing process has created an interwoven network of inter industry trade flows across countries, involving the transition of intermediate goods across borders until a final assembly destination is reached (Gabrisch et al. 2016; Shimbov et al., 2016). This vertical integration trend led to the new trade theory (NTT) hypothesis that the main factor determining international trade is economies of scale and network effects occurring in key industry sectors. These can be sufficiently significant to outweigh the more traditional theory of comparative advantage. This study concentrates primarily on the “new” trade theory, originally espoused by Krugman in 1979, in which he developed his general equilibrium model of non-comparative advantage trade, arguing that returns to scale were an important determinant of growing international trade (Krugman, 1979). This has led to research seeking to determine the effect of trade policy and multi-factor content on productivity, profitability, exports, firm size, imports and the effect on local producers.

In his review of literature, Tybout (2003) concludes that foreign competition causes price cost mark ups to fall and locally based firms to contract, or even exit the market. International trade allows larger more productive firms to expand their market base creating greater efficiency, while exporters increase in size, are more efficient and supply better quality products. Hence, unfettered access to the EU 15 developed market economies, allied to increased competition because of imports from the same source, conforms to Tybout's findings and new trade theory. It would therefore be prudent to evaluate the success of those Balkan countries which are members against those which are not. At the macroeconomic level, convergence between the EU 15 (countries joining before 2004) and the Balkan countries, appears to be occurring at a slow pace. This might indicate that some key determinants are not in place (Botric, 2011). Conflicting views in literature relate to the advantages of EU accession (Börzel 2011) and whilst his paper emphasises governance issues, which could be interpreted as political failure, others claim that there is an inherent developmental divide between the Western and Eastern European states which the EU fails to rectify. Epstein (2014) claims that in areas of consumption and FDI the type of investment encouraged by the EU has contributed to both a division of labour and exclusion from innovative processes thus depriving the Eastern states of economic gains. She further criticizes the World Bank and other supra-national institutions of an overly optimistic view of the benefits of EU expansion resulting from the imperative of supporting the neoliberal agenda (see also Epstein and Jacoby 2014). Furthermore, the internalisation of the Washington Consensus paradigm and its application throughout the customs union provides a further justification for an alternative view of the potential benefits of membership (see Lutz and Kranke 2014. Fitoussi and Saraceno 2012).

Borocz (2012) also claims that Hungary has failed to capitalise on EU membership due to the dominance of EU capital in assembly plant manufacturing resulting in high import content in relation to exports allied to labour market failure. The unrelenting claims of supra-national institutions and the tendency amongst economists to accept as a given the neoliberal agenda drowns the discordant views of the dissenting voices. Thus, we test the following hypothesis:

Hypothesis 1: EU membership provides a productivity advantage to firms within the new member states.

Recent academic literature revealed the relevance of the link between finance and firms' productivity growth and whilst this study is not confined to research on SMEs, they represent 90 per cent of the sample (Levine 2005). A study by the World Bank (2014) revealed that in emerging markets, more than 50% of SMEs are credit constrained, 70% do not use external financing from banking or equity financial institutions, and of the 30% receiving credit, 15% are underfinanced from these sources (Hölscher et al., 2016).

Wagner (2014) in his survey of credit constraints and international trade suggests that work carried out in this area is itself constrained because results to date cannot be compared because of the different econometric models in use with an added limitation that there is a paucity of sound measures of credit constraints for smaller companies.

Access to finance by SMEs has long been problematical. Debate has focussed on whether the existence of information asymmetries creates circumstances of credit shortages or credit gluts (EBRD, 2015). In this study, the basis of the analysis of loans on firm level performance is contained in Levine's (2005) review of the theoretical and empirical literature on finance and growth. Levine identifies five main ways by which, in theory, finance contributes to economic growth: the availability of savings, investment information, the management of risk, the existence of a due diligence process and the facilitation of trade in economic commodities and services. Such considerations provide good reason to suggest that finance has an important role to play in development, but they do not, as Levine (2005) argues, constitute a rationale to prefer banks over other forms of finance.

According to Levine (2005), the dominant form of empirical research has been a cross-country study linking economic growth to a measure of financial development. The potential importance of firm level studies in resolving a number of issues, including better detailed information, causality and firm heterogeneity, have long been acknowledged in literature. Nonetheless, there are few firm level studies on the effects of finance on productivity and other aspects of firm performance (Hölscher, et al., 2016).

A recent study by Levine and Warusawitharana (2014) makes a significant contribution, in part, by enhancing the theoretical foundations for the link between finance and productivity growth, finding that financial frictions affected both investment and output per worker. There is some evidence that, following the accession of new member states, credit constraint was responsible for the lack of productivity improvements in relation to the more established members of the EU. In relation to the transitional economies, Djalilov and Hölscher (2016) found evidence that the early transition economies, namely the new member states, had greater credit availability from banks and the financial sector than the states of the old Soviet Union. Furthermore, they had lower loan loss provisions and less reliance on equity, indicating a level of greater efficiency and strength in depth within the banking sector. Literature suggests that the predominance of foreign banks with enhanced credit scoring criteria, allied to the necessity to improve capital ratios at home, may be contributory factors, together with the underdevelopment of capital markets (Caviglia et al., 2002; Thimann, 2002; Volz, 2010; Estrin and Uvalic, 2016). There is little evidence of exploration of the relationship between the level of productivity, accession to EU membership and access to finance, although work done suggests a reduction in productivity due to

misallocation and credit constraint. Gabrisch 2015, however, maintains that a major factor in credit constraints is the level of nonperforming loans and the reluctance of policy makers to confront the issue and this together with a poor level of financial intermediation lies at the heart of the problem of access to finance. This paper will contribute by identifying the effect of membership and receipt of loans both in and out of the EU, and through the use of quantile regression, measure where, along the productivity distribution curve, the greatest influence lies. Therefore, we formulate the following:

Hypothesis 2a: The availability of loans enhances the effect of EU membership.

Hypothesis 2b: The availability of loans improves performance in firms outside the EU.

Hypothesis 2c: The availability of loans improves productivity.

Since Slovenia and a further eight Eastern European transitional economies acceded to the EU in 2004, followed by Bulgaria and Romania in 2007 and Croatia in 2013, the question has arisen whether the countries of the Western Balkans could be integrated more promptly. Barriers to membership remain within the Balkan five (Albania, Bosnia Herzegovina, Kosovo, Montenegro and Serbia) and whilst this paper is not focussed on foreign direct investment (FDI), there is empirical evidence that a negative attitude towards investing in the Balkans can be alleviated, to some degree, by EU membership (Estrin and Uvalic, 2016). Other factors include the size of the economies and distance from investment hubs, but principally the paucity of institutional processes. There is ‘a negative “Western Balkans” effect’ on FDI (Estrin and Uvalic, 2013, p.5) resulting in the need for firms to find alternative sources of finance either from an internal capital market or in the form of loans. The Western Balkans were, however, the recipients of substantial capital inflows prior to the financial crisis of 2008 but were subjected to significant outflows thereafter (Gabrisch et al 2016) and it is plausible to suggest that different investor priorities rather than a negative attitude to the Balkans may be an alternative rationale to the paucity of FDI. There was an assumption amongst economists that the privatisation programme undertaken by the Eastern European transition economies would result in a significant improvement in firm level performance. The result has been more nuanced, with firms bought by foreign investors being significantly more productive than those in domestic ownership (see Gabrisch and Hölscher, 2006; Wagner, 2012; Estrin et al., 2009; Irdam et al., 2015; Waldkirch, 2014). From the theoretical arguments and empirical evidence, we formulate the following:

Hypothesis 3: FDI has a positive influence on firms’ productivity both in manufacturing and service sectors.

In relation to exports, a survey of 54 micro-econometric studies in 34 countries published between 1995 and 2006, shows that exporting firms are more

productive than non-exporters (Fryges and Wagner, 2007). Thus, it is important to control for exports in any study relating to productivity. Using firm-level data, Berman and Héricourt (2010) found that productive efficiency, when allied to access to finance, increased the propensity to export. Minetti and Zhu (2011), using Italian firm level data, found that firms facing credit constraints exhibited a weaker export performance.

Hypothesis 4: Exports positively affects firms' productivity in manufacturing and services sectors.

As a driver of productivity, the EBRD Transition Report for 2014 focussed on innovation but recognised that capital intensity (capital per worker), proximity to the main business centre (infrastructure), skilled labour, competition and foreign ownership are also important determinants. Additionally, firms trading nationally or internationally are more productive than firms primarily targeting local markets (EBRD, 2014). Literature also reveals that a more competitive market results in improved productivity (Bridgeman, 2010). Clearly, membership of the EU significantly increases the competitive environment. Within the transitional economies, there were concerns about the development of competition policy, although these have been largely allayed (Gabrisch and Hölscher, 2006). Within the new member states there is evidence that “a well-designed and well implemented competition policy has a significant impact on TFP growth” (Buccirossi et al., 2013, p.1334). It is assumed the greater the skill base the more productive the firm and evidence suggests the greater the proportion of highly skilled workers, the more positive the result for labour productivity and profit. A more comprehensive review of Western Balkans competitiveness and productivity constraints can be found in Gabrisch et al. (2016) who emphasises the necessary improvements required in infrastructure and institutional development. These additional determinants have an influence on the productive environment and are therefore legitimate covariates to EU membership and loans, which are the treatment variables in this paper.

The regression analyses controls for capital, skilled labour, competition, exports and foreign ownership together with infrastructure and institutional development. The outcome variable productivity, measured as output per worker, has been selected as a measure of firm level performance due to its importance to economic growth. A comprehensive review of literature suggests that whilst managers have a good deal of control over the endogenous determinants of production, they can do little about exogenous influences (Syverson 2011). Whilst a good deal of literature exists on the subject (see Syverson 2011 for more detail), the majority deals with the specific issues grounded in theory; little exists that examines the relative performance of firms subjected to significant economic change, the materiality of funds flow and capital allocation.

Besides EU membership as one of the treatment variables (which is self-explanatory), the second treatment variable- loan - is constructed from the question in BEEPS 2013 survey: “At this time, does this establishment have a line of credit

or a loan from a financial institution?” It then allows the comparison of the productive performance of those in receipt of loans against those with none. Campos et al. (2014) investigated whether membership of the EU improved both per capita income and labour productivity using synthetic counterfactual methodology which measures the outcome against a synthetically produced counterfactual of the outcome if membership had not been achieved. They find that membership of the EU provided benefits for all countries with the exception of Greece. This study is an important contribution to the debate on the efficacy of EU membership and adds to that debate by comparing two groups of countries, one in membership and the other in the accession process, providing an insight in the differing performance of both EU membership, non-EU membership and loans in each of the two groups, augmented by an identification of the effect of observed variables on the outcome variable (output per worker) across the quantile distribution curve. Additionally, the scant nature of literature analysing the effect of EU membership, allied to access to finance and other key determinants to firm level performance, justifies the claim that this paper is a contribution to the research gap.

METHODOLOGY

The paper compares the influence of EU membership and jointly and severally, receipt of loans on the productivity (dependent variable) performance, measured as output per worker, of firms in the Western Balkans. The use of output per worker as a measure of productivity follows other papers which have used BEEPS data and log of sales divided by total employees for measurement purposes (see D’Souza et al. 2017, Pfeifer 2015, Waldkirch 2014, Dutz and O’Connell 2013, Gorodnichenko and Schnitzer 2013, Ricci and Trionfetti 2012). The comparison is between firms within EU member states and those outside, with the objective of measuring performance differences. The analysis identifies the influence of membership and loans at points across the productivity distribution curve to include the significance of control variables selected with reference to theory and literature. The selected methodology answers the key objectives of ensuring a robust estimator to reduce bias on unobservables.

We use a multiple treatment approach (with two treatment variables - EU membership and loans) and perform quantile regressions using the `ivqte` Stata command which has the advantage of producing analytical standard errors that are consistent also in the event of heteroscedasticity (Frolich and Melly 2010). Two distinct techniques are used – the Inverse Probability Weighted Regression Adjustment (IPWRA) estimator and quantile treatment effects (QTE) modelling. The former is based on the premise that the effect of EU membership and receipt of loans as a treatment assignment – the Average Treatment on the Treated (ATT) effect – must be estimated. Essentially, the research follows the most common approach by matching, by means of propensity scores, EU firms and/or firms receiving loans (“treated firms”) to non-EU firms which did not receive a loan

(“untreated firms”) with similar characteristics— which thus constitute a comparison group— and then to estimate the difference between output per worker (productivity) for treated firms and the outcome for non-treated firms (Cerulli, 2010).

To attribute the estimated difference to a treatment assignment safely, treated firms must be similar to untreated in all respects except for EU membership and/or loan receipt. This depends on two identifying assumptions. The conditional independence assumption (CIA), or selection on observables, which posits that the outcome in the case of no treatment is independent of treatment assignment, conditional on covariates X (Imbens, 2004; Imbens and Wooldridge, 2009) and the overlap or common support condition, whereby the estimated propensity scores take positive values (Heckman and Vyttilacil, 2007).

Treatment effects are estimated in the multiple treatment context to ensure that EU membership and non-membership are carried out simultaneously. A matching approach with multiple treatments is first introduced by Lechner (2001). There are $M+1$ treatments, whereby treatment equals to zero denotes the absence of both EU membership and loan receipt. The average treatment effect on the treated (ATT) effect is then calculated as:

$$ATT = E(Y^m|T = m) - (Y^l|T = m) \quad (1)$$

Where m denotes the treatment level, l represents the comparison group (the treatment level to which m is compared), and Y^m and Y^l denote outcomes in states m and l respectively.

The inverse probability of treatment weighting regression adjustment (IPWRA) estimator is employed; the main advantage being its double robust property. If either the propensity score model (the outcome model) or the treatment model is correctly specified, the estimator will yield treatment effects with a lower bias than other estimators not characterized by the double-robustness property (Hirano et al., 2003). The IPWRA estimator consists of three steps. Firstly, for each firm in the sample, the treatment model estimates the propensity score, which is the probability for each firm of participation (“treatment assignment”). Given that multiple treatment effects are evaluated, the propensity scores are estimated by a multinomial logit model, incorporating all four treatment levels: no EU membership and no loan; no EU membership with loan; EU membership and no loan; and EU membership with loan. The choice of the model is motivated by the nature of the treatment variable, which has more than two outcomes with no natural ordering. The propensity scores enable firms to be matched within each treatment level. Secondly, regressions are estimated by the fractional logit model, as the outcome variable is the inverse of the estimated propensity scores and is used as weights on covariates X and the treatment dummies. Thirdly, from each regression, the ATT effect is computed as the difference in the weighted averages of the predicted outcomes. Valid standard errors (of the Huber/White/sandwich type) are reported,

which take into account that the estimates are computed in a three-step approach (Emsley et al., 2008).

Typically, the response variable y is some function of predictor variables X , so that $y = f(X)$. Most regression applications focus on estimating rates of change in the mean of the response variable and are defined for the expected value of y conditional on X , $E(y|X)$. This poses problems for regression models with heterogeneous variances, such as for firms across countries and industry sectors. Heterogeneous variances imply that there may be some changes that do not focus exclusively on the mean and others that impact differently across the probability distributions. Focusing exclusively on changes in the mean may underestimate, overestimate, or fail to distinguish real non-zero changes in heterogeneous distributions (Cade et al., 1999).

The introduction of quantile treatment effects (QTEs) allows the measurement of the effect on the outcome variable (productivity) across the different percentiles of the productivity distribution curve, using median as opposed to the mean. The use of quantile regressions continues to evolve, and model selection is dependent on whether the QTE is conditional or unconditional and the treatment variables exogenous or endogenous. The conditional model is estimated, thus controlling for firm and market characteristics and, due to the lack of valid instruments in the datasets, it is not possible to estimate conditional endogenous models. Thus, EU membership and access to loans are regarded as exogenous. This restricts the estimation strategy to the application of the estimator proposed by Koenker and Bassett (1978).

The standard for linear quantile regressions is a conditional model assuming selection on observables. It is assumed that Y is a linear function of X and D . The model for potential outcomes is:

$$Y_i^d = X_i \beta^\tau + d\delta^\tau + \varepsilon_i \text{ and } Q_{\varepsilon_i}^\tau = 0 \quad (2)$$

So x is a vector of the conditional exogenous variables, $i=1, \dots, n$ and $d \in (0, 1)$ is a set membership of the treatment variables EU membership or loans. Q_{ε}^τ refers to the τ^{th} quantile of the unobserved random variable ε_i . It is assumed that $Q_\tau(\varepsilon_i | \beta, x_i) = 0$ and is introduced to ensure that the random errors are centred on the τ -th quantile (Marino and Farcomeni 2015). β^τ and δ^τ are the unknown parameters of the model. δ^τ represents the conditional QTE's at quantile τ . The linearity assumption above is insufficient to identify the QTE's because the observation D_i may be correlated with ε_i . The assumption is that D and X are exogenous. The selection on observables with X can be taken to be:

$$\varepsilon \parallel (D, X) \quad (3)$$

Taking Equations (2) and (3) together implies that $Q_{Y|X,D}^\tau = X\beta^\tau + D\delta^\tau$ which allows the recovery of the unknown parameters of the potential outcomes from the

joint distributions of the observed variables Y , X and D . The estimator by Koenker and Bassett (1978) can now be utilised to estimate the unknown coefficients:

$$(\hat{\beta}^\tau, \hat{\delta}^\tau) = \arg \min \beta, \delta \sum \rho_\tau(\mu) (Y_i - X_i\beta - D_i\delta) \quad (4)$$

where $\rho_\tau(\mu) = \mu * \{\tau - 1(\mu < 0)\}$. The IVQTE model used generates analytical standard errors that are also consistent in the event of heteroscedasticity (Frolich and Melly 2010).²

DATA

The data for this study was taken from the *Business Environment and Enterprise Performance Survey* (BEEPS) produced by the World Bank and European Bank for Reconstruction and Development (EBRD). BEEPS is a firm-level survey based on face-to-face interviews with managers and examines the quality of the business environment. The survey data has been used in more than 450 papers since 2012 which are published in a number of highly ranked journals (for a comprehensive list of examples see the methodology section p.10). The survey offers a representative picture of the business climate experienced by private firms together with firm performance and characteristics. The survey sample provides comparative data across time, countries and firms and allows disaggregation to size, sector and regions. The data is used in academic and policy papers with more than 300 papers written to date (World Bank 2016). Data was obtained from the 2013 survey consisting of nine countries in the Balkan region, three of which, at the time of the survey, were EU members.³ The sample allowed the evaluation of the effect of EU membership on firm performance and the significance of loans and access to finance on firms in the EU and in countries in transition. Additionally, the influence of certain key determinants was measured (for the variable description, see Table A1 in the Appendix).

The descriptive statistics in Table A2 in the Appendix indicate that the majority of the sample is services firms. From a total of 2,433 firms, 90% (or 2,179 firms) are SMEs, as noted earlier which, on the assumption that this reflects the total population, demonstrates their importance to the economy. Output per worker is broadly similar, with service firms being marginally more productive. Manufacturing companies have a larger capital base and a greater propensity to export. Between service and manufacturing firms the gap between the costs per worker is significant.

² A more comprehensive explanation of the estimation of quantile treatment effects in Stata can be found in Frolich and Melly (2010).

³ The inclusion of Croatia as an EU member in this study may be controversial since the accession date and survey results coincide, however, we believe that EU membership is the formal end to a process that has taken many years in transition and the economic conditions within the country would already conform to the *acquis communautaire* (Börzel, 2011).

MODEL SPECIFICATION

To estimate the individual and joint effects of EU membership and access to loans on productivity (measured as output per worker), the variable *Treatment* was created with the following values:

- Treatment (T) =0 if a firm is not in EU and did not received a loan (57%);
- Treatment (T) =1 if a firm is in EU but did not receive a loan (53%)
- Treatment (T) =2 if a firm is not in EU but has received a loan; (43%)
- Treatment (T) =3 if a firm is in EU and has received a loan (47%)

The use of EU membership as a treatment variable allows a comparison of the productivity of firms within and outside the EU. This allows an analysis of the effect of the economic shock of joining a significantly more productive economic bloc.

The outcome variable productivity (measured as output per worker), is analysed in relation to EU membership and receipt of loans whose relationship, as factors of production, is predicated on the premise that misallocation of capital, following the adoption of the euro and a reduction in interest rates, led to a reduction in productivity in Southern Europe (Gopinath et al 2015).

The selection of matching variables is predicated by reference to relevant literature where each has been identified as influencing firm level performance.⁴ To minimise the selection on unobservables, the models include a large number of control variables (see Epifani, 2003; Segerstrom and Gustafsson, 2006; Bellack et al., 2008; Melitz and Ottaviano, 2008; Bridgeman, 2010; Covers, 2014; Levine and Warusawitharana, 2014; Waldkirch, 2014; Estrin and Uvalic, 2016). The list of matching (control variables) and their definitions are presented in Table A1.

There is some evidence that the NMS are beginning to achieve convergence with the original EU 15, albeit due to economic stagnation within the Eurozone this is proceeding at a comparatively slower pace (Havlik 2015). Equally the EBRD 2016 believes that progress in the Balkans is being retarded as a result of financial imbalances, credit constraint and a lack of FDI (see also Estrin and Uvalic 2016). The misallocation of capital may be an additional constraint (Gopinath et al 2015). This justifies the use of the second treatment variable; access to finance, measured as receipt of loans.

Closing the productivity and technology gap between the transition countries of Eastern Europe and the EU is an important element of the need to achieve economic convergence and European cohesion. The influence of capital accumulation is critical since it will improve both labour productivity and reduce

⁴ Where values are monetary, they are measured in different currencies requiring conversion into a common currency. Using the 2013 official exchange rates, national currencies were converted into US dollars.

the technology gap (Filippetti and Peyrache, 2013). It is therefore important to control for capital in relation to the measurement of productivity and since BEEPs allows for the disaggregation of *capital* into balance sheet, *replacement and rental* (leasing) it enables an analysis of the significance of each of these variables on the outcome.

The justification for including *exports* and *skilled workers* amongst the control variables is based on Wagner (2012), who found that exporters were more productive and wage premia were statistically significant, indicating that skilled workers have a positive effect on firm productivity. Equally, in relation to skilled workers, there is evidence that Balkan industry lacks skill, due to a mismatch between demand and supply exacerbated by the educational failings of individual states (Gabrisch et al, 2016, Bartlett 2013).

Employment rates in the Balkan region are problematical with new EU member states at 64% and non -EU member states 46%. Evaluating these figures, one might anticipate cost per worker to be suffering some downward pressure, however, a combination of labour market rigidities, incomplete reform programmes, a strong social welfare net and migration of skilled workers have raised wages in relation to productivity, particularly in non-EU member states (Kovtun et al., 2014). To control for this, the variable *Cost per worker* is modelled.

Foreign ownership is a reflection of FDI and evidence exists that it increased in the period before accession into the EU, peaking on the date of accession and declining slightly thereafter. EU member countries have proved a more attractive FDI destination than the Western Balkan states evidenced by a negative effect in this region. This is possibly as a result of the lack of institutional reform and the establishment of strong structural controls (see Krugman, 1979; Epifani, 2003; Estrin et al., 2009; Gustafsson and Segerstrom, 2011; Estrin and Uvalic, 2016; Okafor and Webster, 2015). To control for this effect, the variable *Foreign ownership* is included.

The *acquis communautaire* (accumulated body of EU law and protocols since 1958) has guaranteed the development of bureaucratic institutions within the new member states, although this process is also evident in those countries of the Western Balkans in accession. This is more prominent in Serbia, Montenegro and Macedonia than Albania, Bosnia and Herzegovina and Kosovo (Petrovic and Smith, 2013). To control for this, the models variable *Bureaucracy* is included but the inclusion should not imply that this of itself limits productivity (see Table A1 for variable description).

With respect to firm characteristics, the model also includes firm size and firm age. The inclusion of competition is predicated on the new trade theory and specifically Tybout's (2003) conclusion relating to the effect of foreign firms in relation to local pricing and firm survival. The influence of competition also resonates with international trade, which suggests that larger, more productive firms increase in size and are more efficient. Finally, to account for sectoral

heterogeneity, the model includes dummy variables for low tech, mid tech and services.

EMPIRICAL RESULTS

The first stage is to use the IPWRA estimator to provide a comparison between EU firms and non-EU firms and for those with and without loans and the second stage of the exercise is to use quantile regression to identify where the effect of EU membership and loans is significant along the productivity distribution curve. The evidence can be laid alongside the influence, at each quantile of selected control variables, which will further inform the debate by allowing conclusions to be drawn as to the significance of the effects at certain points along the distribution curve. The disaggregated analysis will allow an increased micro economic evaluation of the result.

Treatment effects of any matching estimator based on the propensity score are only estimated in the region of common support. Thus, it is necessary to check the overlap of the propensity scores at different treatment levels. The overlap plots, reported in Appendix A (figures A1 to A3), reveal that the predicted probabilities are not concentrated near 0 or 1, which implies that the overlap assumption is not violated (Cattaneo et al., 2013). Descriptive statistics are included in Table A2.

Step 1 of the estimation procedure is the treatment (selection) model, which shows the effects of covariates on the probabilities of different levels of treatment, whereby the base is treatment at level 0. Step 2 is the outcome model, which estimates the impact of covariates on the outcome variable. The coefficients in the models are not of interest in themselves, as the purpose of specifying the model is to facilitate the estimation of treatment effects (Cattaneo et al. 2013). Table A3 reports results for the model estimated in the full sample.⁵

Table 1 below shows the estimated treatment effects using the IPWRA estimator. For ease of interpretation the results have been transposed into percentage point increases or decreases in productivity and expressed as a percentage in the text. The analysis covers the full sample of firms in all member states and disaggregated samples of services and manufacturing firms. The results from the full sample have been included for completeness. However, the paucity of observations for capital and skilled workers in the services sector has significantly truncated the observations and thus make the results of limited value. This limitation also applies to the quantile regression modelling. Tables 1 to 4 below show different levels of observations. This is due to missing data for capital and skilled workers within the BEEPS dataset.

⁵ Results for manufacturing and services are not reported but available on request.

Table 1. The estimated ATTs effects using the IPWRA estimator with two treatments: EU membership and access to loans.

Outcome variable	Full sample			Service sector			Manufacturing sector		
	T= 1 vs T =0	T=2 vs T=0	T=3 vs T=0	T= 1 vs T =0	T=2 vs T=0	T=3 vs T=0	T= 1 vs T =0	T=2 vs T=0	T=3 vs T=0
	1.	2.	3.	4.	5.	6.	7.	8.	9.
Output per worker	0.616*** (0.095)	0.386*** (0.104)	0.735*** (0.134)	0.704*** (0.100)	0.440*** (0.092)	0.833*** (0.107)	0.597*** (0.121)	0.360*** (0.125)	0.560*** (0.141)
Output per worker (in %)	0.061*** (0.012)	0.039*** (0.011)	0.074*** (0.014)	0.068*** (0.010)	0.043** (0.009)	0.081*** (0.019)	0.059*** (0.012)	0.036*** (0.120)	0.056*** (0.015)

The analysis indicates that against treatment 0 (firms located outside EU which have not received loans) ($T = 0$), EU firms that have not received loans are 6.1% more productive ($p < 0.01$; Column 1). The effect of a loan receipt, introduced after the effects of EU membership shows a 1.3 percentage point increase⁶ (Column 3) indicating that loans provide a marginal boost to output. However, the joint effect of EU membership and loan receipt is not statistically different from the individual effect of EU membership (Column 1), as their 95% confidence intervals overlap. This indicates that H1 is supported by these results but, in relation to EU member firms, H2 is not supported but is supported in non-EU firms since the effect of a loan receipt is 3.9% ($p < 0.01$; Column 2) indicating the efficaciousness of loans to non-EU member state firms. However, the joint effect of EU membership and loan receipt is not statistically different from the individual effect of a loan receipt, as their 95% confidence intervals overlap. This indicates that EU membership and not receiving a loan is the key driver to productivity within the NMS, and whilst loans provide a marginal advantage within the EU, they are critical to productivity improvement for firms outside the EU. Thus, in relation to H1, the efficacy of EU membership on productivity is proved but the influence of loan receipt is restricted to firms in non-member states (hence supporting H2c).

In relation to the service sector the results are more pronounced, such that the effect of EU membership on productivity is 6.8% ($p < 0.01$; Column 4). This effect increases to 8.1% when a loan is added to EU membership ($p < 0.01$; Column 6). However, the joint effect of EU membership and loan receipt is not statistically different from the individual effect of EU membership, as their 95% confidence intervals overlap. Non-EU firms receiving loans are 4.3% more productive than non-EU firms without loans ($p < 0.01$; Column 5), yet this effect is not statistically different than the joint effect of EU membership and loan receipt (Column 6). Thus, our results suggest that either EU membership or loan receipt has a positive impact on firm productivity, while the joint impact of EU membership and loan receipt does not bring additional productivity increase relative to their individual effects and hence H1 is only partially supported.

Within the manufacturing sector, EU firms without a loan are 5.9% more productive than non-EU firms without loans ($p < 0.01$; Column 7), whilst EU membership combined with a receipt of loans has a statistically significant impact ($p < 0.01$), although not larger than the impact of EU membership alone (Column 9). The effect of a loan receipt on productivity in non-EU firms is 3.6% ($p < 0.01$; Column 8), indicating the greater importance of loans to non-EU firms.

The IPWRA results test H1 and H2 including its subsections and conclude that H1, H2b and H2c are supported concluding that EU membership provides a productivity advantage, but there is little evidence that a combination of EU

⁶ For reasons of brevity percentage results are shown as a percentage but should be interpreted as a percentage point increase.

membership and loans (H1 and H2b) have an enhanced effect on membership alone therefore the enhancing effect of loans is unproven. However, H2b and H2c are supported in relation to firms outside the EU concluding that loans improve productivity.

The IPWRA results are concerned with mean effects and may not reveal the array of effects. The use of quantile regressions allows the analysis to identify where, along the distribution curve, the effects of EU membership and loans are significant and allows an evaluation of the influence of other key variables. The distribution of the dependent variable may change in many ways that are either not revealed or only partially revealed by an examination of the mean (Frolich and Melly, 2010). This study applies selection models based on observables, uses a conditional treatment model based on Koenker and Basset (1978) and regresses on two treatment variables - EU membership and loans. The regressions are carried out on the full Balkan sample and the disaggregated samples of services and manufacturing. The outcome variable is productivity (output per worker) and the treatment variables of interest in these analyses are EU membership and loans. The control variables have been interpreted to provide a comprehensive picture of the significant influences extant in each quantile. For ease of observation in all the QTE models below, the first and last two quantiles have been included since they either reflect the significant results across the productivity distribution, or demonstrate a trend which either ends or continues before or after the 8th quantile.⁷ The estimates shown illustrate the significance of the results in each quantile across each of the distributions. The monetary values have been rescaled (actual number/1000) to provide a coefficient greater than zero where the results are significant.

Table 2 below shows the results for the effect of EU membership (treatment variable) and the control variables on productivity performance over each point (1st to 9th decile) of the productivity distribution curve. EU membership is a positive and highly statistically significant ($p < 0.01$) in the 1st to the 6th decile with the coefficients decreasing in magnitude over the productivity distribution curve. This would suggest that firms at the lower end of labour productivity distribution enjoy the greatest benefit from membership, with no significant results being seen at the upper end of the scale. The importance of capital is also seen as significant with *rental capital* ($p < 0.01$ to $p < 0.05$) being important across the 1st to the 4th decile. This may suggest that below the median point of the distribution, equity, as a means of capitalisation, is in short supply (Estrin and Uvalic 2016). The negative coefficient on *age* ($p < 0.05$) in the 9th decile may indicate that older firms are less productive than more modern enterprises, indicating that they may be privatised firms at the top end experiencing issues with dated equipment and/or practices. The negative coefficient *replacement value of capital* ($p < 0.01$) is reported in the 5th and 8th decile, which may indicate that in parts of the distribution curve, firms are

⁷ The tables with the results for all the deciles are available on request.

struggling to modernise. The positive significance of *Bureaucracy* ($p < 0.05$) in 1st and 9th decile indicates that at the lower and top end of the distribution curve there is an awareness of the impact of institutional development, whilst *size* ($p < 0.1$) in the 2nd and 8th decile reveals that this may be restricted to the larger firms. The negative coefficient on skilled workers ($p < 0.01$ to $p < 0.1$) is possibly a reflection of a skills mismatch allied to a failure of appropriate levels of educational training (Gabrisch 2016; Gabrisch et al 2016). An OECD working paper concluded that “the main results suggest that higher skill and qualification mismatch is associated with lower labour productivity, with over-skilling and under qualification accounting for most of these impacts” (McGowan and Andrews, 2015, pp.32). The positive coefficient of cost per worker ($p < 0.1$) may be a reflection of the comparative advantage of cheaper labour.

In relation to the services sector, all capital and skill based variables have been removed from the model due to a paucity of observations. In contrast to the full sample, the services sector indicates that the impact of EU membership is positive and highly statistically significant ($p < 0.01$) for the 1st to 8th deciles with no significance only amongst the most productive firms. This would suggest that the services sector as a whole has received a significant boost from EU membership and supports H1. As in the full sample, the declining magnitude of the coefficient on EU membership variable is found, suggesting that the most benefit is enjoyed by the least productive firms. *Foreign ownership* has a positive and statistically significant ($p < 0.01$ to $p < 0.05$) effect throughout the distribution, indicating the relevance of FDI in tandem with EU membership and supports H3. *Age* and *size* also have positive and statistically significant ($p < 0.01$ to $p < 0.1$ and $p < 0.01$ to $p < 0.05$ respectively) effects, suggesting an attraction for larger, older firms to foreign investors. Outside the bottom first two deciles of the distribution curve, the negative and highly statistically significant ($p < 0.01$) influence of competition in the upper deciles of the distribution indicates that, in this sector, the competitive environment of the expanded EU is creating pressures within the NMS for the most productive firms. *Cost per worker* has a positive and highly statistically significant ($p < 0.01$) impact on firm productivity throughout the whole distribution range.

Table 2. Results from the QTE model with EU membership as the treatment and output per worker as the outcome variable⁸.

	Full sample				Manufacturing sector				Service sector			
Independent variables	q.1	q.2	q.8	q.9	q.1	q.2	q.8	q.9	q.1	q.2	q.8	q.9
EU membership	0.477*** (0.132)	0.352*** (0.109)	0.080 (0.081)	0.024 (0.093)	0.575*** (0.135)	0.321*** (0.124)	0.130 (0.081)	0.117 (0.090)	0.839*** (0.118)	0.647*** (0.101)	0.178** (0.085)	0.011 (0.093)
Capital (assets)	0.002 (0.001)	0.002 (0.001)	0.001* (0.001)	0.002* (0.001)	0.0020** (0.127)	0.002 (0.124)	0.001* (0.081)	0.002 (0.092)				
Capital (replacement)	0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)				
Capital (rental)	0.070*** (0.021)	0.062*** (0.018)	-0.002 (0.014)	0.020 (0.047)	0.073*** (0.0250)	0.061*** (0.018)	0.006 (0.015)	0.016 (0.038)				
Export	0.493* (0.255)	0.183 (0.282)	0.131 (0.306)	-0.068 (0.358)	0.206 (0.314)	0.192 (0.303)	0.051 (0.265)	-0.022 (0.353)	0.401 (0.407)	-0.121 (0.392)	0.367 (0.388)	0.390 (0.369)
Skilled workers	-0.348* (0.211)	-0.511** (0.202)	-0.519*** (0.189)	-0.780*** (0.217)	-0.500** (0.244)	-0.479** (0.216)	-0.364** (0.176)	-0.711*** (0.215)				
Cost per worker	0.013*** (0.002)	0.015*** (0.003)	0.014*** (0.002)	0.010*** (0.001)	0.012*** (0.001)	0.016*** (0.004)	0.016*** (0.002)	0.011*** (0.002)	0.015*** (0.002)	0.016*** (0.005)	0.022*** (0.006)	0.024*** (0.005)
Foreign owned	-0.001 (0.003)	0.001 (0.004)	0.002 (0.002)	0.001 (0.002)	-0.001 (0.005)	0.003 (0.003)	0.001 (0.002)	0.001 (0.002)	0.004 (0.003)	0.008*** (0.002)	0.004** (0.002)	0.007** (0.003)
Firm age	-0.004 (0.004)	-0.005 (0.004)	-0.001 (0.002)	-0.006** (0.002)	-0.011* (0.006)	-0.004 (0.004)	-0.002 (0.002)	-0.007*** (0.002)	0.015*** (0.005)	0.015*** (0.005)	0.010** (0.005)	0.009 (0.006)
Bureaucracy	0.213** (0.092)	0.105 (0.084)	0.082 (0.077)	0.172* (0.097)	0.213** (0.104)	0.091 (0.088)	0.158* (0.084)	0.246** (0.102)	0.158 (0.102)	0.143* (0.080)	0.126* (0.069)	0.089 (0.079)
Firm size	0.115	0.146*	0.081	0.125*	0.212**	0.125	0.099*	0.150**	0.333***	0.291***	0.118**	0.099*

⁸ Note that the observations for the full, manufacturing and services sample differ. This is because of the omitted variables of capital and skilled workers in the services sector has reduced the service sector contribution to 100 firms. The 450 observations in the manufacturing sector are the total available and the services sector observations have been increased by omitting capital and skilled workers from the regression.

	(0.092)	(0.083)	(0.060)	(0.069)	(0.094)	(0.090)	(0.059)	(0.066)	(0.088)	(0.069)	(0.052)	(0.059)
Competition	-0.037	0.014	-0.098	-0.099	-0.136	0.021	-0.095	-0.116	-0.047	-0.139	-0.233***	-0.259***
	(0.128)	(0.111)	(0.084)	(0.091)	(0.131)	(0.116)	(0.086)	(0.094)	(0.118)	(0.097)	(0.081)	(0.091)
Low-tech	-0.339**	-0.407***	-0.283**	-0.219*	-0.176	-0.361**	-0.378***	-0.260**				
	(0.150)	(0.137)	(0.110)	(0.129)	(0.181)	(0.165)	(0.116)	(0.130)				
Mid-tech	-0.291	-0.287*	-0.216*	-0.265**	-0.184	-0.250	-0.248**	-0.287**				
	(0.180)	(0.153)	(0.111)	(0.128)	(0.208)	(0.167)	(0.119)	(0.123)				
Services	-0.286	-0.471	0.374	0.883*	1.025	0.680	-0.257	-0.527**				
	(0.369)	(0.320)	(0.370)	(0.523)	(0.974)	(0.703)	(0.690)	(0.218)				
Constant	9.022***	9.603***	10.894***	11.477***	9.027***	9.581***	10.642***	11.296***	7.920***	8.673***	11.033***	11.562***
	(0.260)	(0.244)	(0.183)	(0.207)	(0.297)	(0.270)	(0.190)	(0.240)	(0.155)	(0.132)	(0.141)	(0.174)
No of obs.	550	550	550	550	450	450	450	450	1,370	1,370	1,370	1,370

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

With respect to the manufacturing sector, the 1st and 2nd decile of the distribution finds EU membership to have a positive and highly significant ($p < 0.01$) effect, although above the 2nd decile, significance levels and the magnitude of the coefficients are declining, with the evidence suggesting support for H1 up to the 7th decile. *Balance sheet capital* has a positive and significant effect in 1st decile and in 8th decile ($p < 0.01$ and $p < 0.1$ respectively). Across the first half of the distribution curve, *rental capital* is positively significant ($p < 0.05$), suggesting that leasing is an important source of finance up to the median. The negative coefficients on replacement capital in the 3rd decile and 8th decile ($p < 0.05$ and $p < 0.01$ respectively) indicate that replacing aging assets may be problematical and points to a difficulty raising capital within the manufacturing sector, particularly amongst the least productive firms. *Firm size* is statistically significant at the conventional level (from 1% to 10% level) throughout the distribution, suggesting the importance of economies of scale, whilst *firm age* has a negative effect in 9th decile. In the upper and lower deciles, the positive effect of *bureaucracy* ($p < 0.05$ to $p < 0.1$) indicates the importance of institutional development. Negative effects of skilled workers and positive effects of cost levels per worker feature significantly (at the 1% and 5% levels) throughout the distribution and these findings are consistent with the earlier findings in this study.

Table 3 below shows the results when loan receipt is the treatment variable. In the full sample, loans are only significant in the 1st and 2nd decile ($p < 0.01$ and $p < 0.05$ respectively) suggesting an efficacy that is confined to the least productive firms and therefore support for H2c is restricted to the bottom 20% of the productivity distribution curve. *Rental capital* has positive and significant ($p < 0.01$) effects in the 1st and 2nd deciles, confirming the necessity for borrowed capital below the median of the productivity distribution. *Bureaucracy* and *firm size* are positively significant in the 1st and 9th decile, whilst *firm age* is negatively significant ($p < 0.05$ and $p < 0.1$ respectively), which may be indicative of older firms being less productive and larger ones having a greater realisation of the influence of institutional development. The positive, but marginally significant ($p < 0.1$) effects of *balance sheet capital* in the 1st and 9th decile and the negative, but marginally significant ($p < 0.1$) effect of *replacement capital* in the 9th decile may emphasise the impairment to productive development. The negative coefficient on skilled workers ($p < 0.01$ to $p < 0.05$) and positive coefficient of cost per worker ($p < 0.01$) are features of results throughout the quantile regression models and possible explanations have been given earlier in this study.

Table 3. Results from the QTE model with a loan receipt as the treatment variable and output per worker as the outcome variable.

Independent variables	Full sample				Manufacturing sector				Service sector			
	q.1	q.2	q.8	q.9	q.1	q.2	q.8	q.9	q.1	q.2	q.8	q.9
Loan	0.463*** (0.137)	0.232** (0.105)	0.100 (0.084)	-0.016 (0.092)	0.410** (0.159)	0.241** (0.115)	0.054 (0.086)	0.063 (0.096)	0.284** (0.141)	0.319*** (0.102)	0.080 (0.083)	0.074 (0.088)
Capital (assets)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	0.002** (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)				
Capital (replacement)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)				
Capital (rental)	0.076*** (0.011)	0.068*** (0.027)	-0.002 (0.016)	0.019 (0.044)	0.079*** (0.024)	0.059*** (0.000)	0.011 (0.019)	0.010 (0.002)				
Export	0.418 (0.295)	0.088 (0.278)	0.191 (0.305)	-0.045 (0.336)	0.205 (0.339)	0.098 (0.284)	0.225 (0.274)	0.037 (0.278)	0.285 (0.406)	-0.164 (0.441)	0.220 (0.390)	0.425 (0.383)
Skilled workers	-0.602*** (0.212)	-0.567*** (0.207)	-0.407** (0.186)	-0.803*** (0.219)	-0.632*** (0.237)	-0.272 (0.225)	-0.434** (0.179)	-0.717*** (0.217)				
Labour cost	0.014*** (0.002)	0.019*** (0.003)	0.013*** (0.002)	0.010*** (0.001)	0.014*** (0.003)	0.019*** (0.003)	0.015*** (0.002)	0.011*** (0.002)	0.016*** (0.004)	0.019*** (0.006)	0.027*** (0.006)	0.024*** (0.005)
Foreign owned	-0.001 (0.003)	-0.004 (0.005)	0.003 (0.003)	0.001 (0.002)	-0.001 (0.006)	0.001 (0.004)	0.002 (0.002)	0.001 (0.003)	0.004 (0.004)	0.009*** (0.002)	0.004** (0.002)	0.008** (0.003)
Firm age	-0.007* (0.004)	-0.002 (0.004)	-0.002 (0.002)	-0.006** (0.002)	-0.009 (0.006)	-0.001 (0.003)	-0.001 (0.002)	-0.005** (0.002)	0.013** (0.006)	0.015*** (0.005)	0.011** (0.005)	0.005 (0.006)
Bureaucracy	0.175** (0.085)	0.078 (0.077)	0.080 (0.080)	0.157* (0.094)	0.115 (0.090)	0.044 (0.076)	0.141 (0.087)	0.210* (0.108)	0.083 (0.137)	0.109 (0.089)	0.131* (0.070)	0.104 (0.079)
Firm size	0.200** (0.087)	0.181** (0.075)	0.046 (0.060)	0.120* (0.063)	0.245*** (0.088)	0.091 (0.079)	0.052 (0.059)	0.100 (0.069)	0.396*** (0.105)	0.291*** (0.073)	0.121** (0.055)	0.106* (0.061)

Competition	-0.019 (0.116)	0.002 (0.103)	-0.143* (0.086)	-0.096 (0.091)	-0.033 (0.129)	-0.063 (0.109)	-0.097 (0.086)	-0.166* (0.097)	-0.113 (0.131)	-0.156 (0.102)	-0.284*** (0.081)	-0.295*** (0.089)
Low-tech	-0.376** (0.151)	-0.352** (0.143)	-0.335*** (0.112)	-0.221* (0.118)	-0.293* (0.162)	-0.169 (0.161)	-0.382*** (0.115)	-0.269* (0.142)				
Mid-tech	-0.245 (0.179)	-0.107 (0.148)	-0.215* (0.117)	-0.261** (0.116)	-0.231 (0.198)	0.004 (0.162)	-0.286** (0.116)	-0.315** (0.129)				
Services	-0.167 (0.278)	-0.263 (0.254)	0.393 (0.406)	0.837* (0.501)	1.210 (0.957)	0.786*** (0.252)	-0.378 (0.753)	-0.490 (0.876)				
Constant	9.018*** (0.251)	9.367*** (0.232)	10.908*** (0.179)	11.519*** (0.200)	9.038*** (0.258)	9.265*** (0.257)	10.773*** (0.185)	11.433*** (0.231)	8.022*** (0.171)	8.745*** (0.142)	11.045*** (0.145)	11.570*** (0.169)
No of obs.	550	550	550	550	450	450	450	450	1,370	1,370	1,370	1,370

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

In relation to the service sector, capital and skill set variables have been omitted due to paucity of observations. Receipt of loans is positively significant ($p < 0.01$) for the 1st to the 6th decile. This suggests that support for H3 is limited to just beyond the median of the 60% and that more productive firms have a limited benefit. With the exception of the 1st decile, *foreign ownership* is positively significant throughout the distribution ($p < 0.01$ to $p < 0.05$) and, with the exception of the 9th decile, where it is insignificant. This indicates that there is strong support for H3 within the services sector and emphasises its importance to the Balkan region's economy. *Age* is now seen as a positive attribute ($p < 0.01$ to $p < 0.05$). *Firm size* (at the conventional levels of significance, i.e. $p < 0.1$) is positive throughout the distribution indicating that, together with age, it is seen as an important influence on firm productivity. The negative coefficient on *competition* appears significantly across the distribution from the 3rd to the 9th decile ($p < 0.01$ to $p < 0.1$), increasing in magnitude at higher levels of the distribution curve. This indicates that the higher up the productivity curve, the greater the pressure from competition, affirming that larger, older firms are feeling the greatest competitive pressures. Loans appear to be more important below the median, which is the case even under foreign ownership. This may be the result of the provision of loans from the transnational companies, or the availability of collateral to lenders who are themselves foreign owned banks. However, these findings support H2c and H3 and emphasises the importance of FDI in the sector together with the availability of loans at the lower end of the spectrum. The importance of firm age and size suggests that older, larger and more experienced firms are attractive to FDI. Above the 1st and 2nd decile, the negative effect of competition is a reflection of increasing competitiveness within the enlarged EU, encouraged by the presence of foreign ownership. The ever present positive significance of cost per worker ($p < 0.01$) indicates that the service sector is comfortable with its cost per worker ratios.

Regarding the manufacturing sector, loans are positively significant ($p < 0.05$) in the 1st and 2nd decile suggesting that, within the sector, the least productive firms are loan dependent and this view is supported by the positive effect of *rental capital* ($p < 0.01$ to $p < 0.05$) in the same deciles. Therefore, the availability of loans and rental capital should be viewed in tandem. The results provide limited support for H2b and H2c with no significant effect being seen above the median. *Size* is positive and highly statistically significant ($p < 0.01$) in the 1st decile and *Foreign ownership* ($p < 0.1$) in the 3rd decile, together with the negative coefficient of replacement capital ($p < 0.05$). *Age* is negatively significant ($p < 0.05$) in the 9th decile. This suggests that larger firms, possibly privatised, see the opportunities of economies of scale but struggle to achieve productivity improvement, whilst foreign ownership and the negative perspective of replacement capital may reflect foreign owners confronted with the scale of modernisation required. The negative impact of firm age in the 9th decile may indicate that older firms have difficulty with aging assets and the required cultural changes. Negative effects of skilled workers

and positive effects of labour costs feature significantly throughout the distribution and give credence to the possible explanations given earlier in this paper.

The IVQTE model has tested H2c, H3 and H4 and concludes that the availability of loans improves productivity up to the 6th decile of the distribution curve suggesting that the least productive firms are the beneficiaries. This may be because the most productive firms are better capitalised or are less reliant on debt. The key is membership, and this is particularly true of the services sector where firms up to the 8th decile have strong statistical significance. The effect in manufacturing is more muted beyond the first two deciles with weaker coefficients and significance. Equally the services sector appears to have a greater reliance on loans (H2) with the first 6 deciles enjoying the benefits against manufacturing where loans are only significant in the first two deciles. However, in this sector rental capital (leasing) is significant up to the median which may indicate leasing is used as an alternative to loans since the equipment leased provides its own collateral. The effect of FDI on productivity (H3) is highly significant but is only supported in the services sector with significance across the productivity distribution curve. This may be due to the strength of the services sector in the economy where it accounts for 66% of added value in Serbia and Kosovo increasing to 79% in Montenegro and is therefore likely to be a more attractive target for FDI. Manufacturing on the other hand, at least in the BEEPS survey, is populated by low tech SME's and with the increasing cost of labour in the Balkan region firms may be losing some of their comparative advantage. Equally it has to be recognised that prior to the financial crisis the Balkan region enjoyed significant inflows of funds, but this has been reversed since that period and the BEEPS survey conducted in 2013 may well be reflecting this trend (Gabrisch et al 2016). The puzzling result is the lack of support for H4 on the effect of exports on productivity, which is not significant in any sector. This may be due to the low level of exports from seven of the eight countries where they account for no more than 20% of GDP and whilst there is evidence some countries are well integrated into international production networks some 60% of exported goods are from low tech industries and tourism where increasing labour costs are diminishing any comparative advantage (Gabrisch et al 2016).

Figures A4 to A9 in Appendix A confirm that the effect of EU membership and loans decline as the productivity of firms increase; the only exception being in the loan model, where the efficacy of loans in the service sector rises to the median point and then rapidly declines.

Throughout the quantile analyses conducted, negative skill levels and positive cost per worker feature throughout the distribution and whilst the positive cost per worker reflects the comparative advantage of cheap labour, driven by high levels of unemployment in the Western Balkans, the negative coefficient of skilled labour is the result of a mismatch between the demand of the burgeoning services sector and new technologically based businesses. This is due in part to a failure of

the education system to adapt to the changing skill set required amongst the working age population (Bartlett 2013).

CONCLUSIONS

Our results indicate that EU membership contributes to improved productivity because of unfettered access to the customs union, which promotes opportunities for improved economies of scale and the advantages of network effects. The significance of loans and rental capital in relation to firm productivity is consistent with the findings in Levine and Warusawitharana (2014). The first hypothesis that EU membership provides a productivity advantage to firms in member states is supported by the findings of the IPWRA model, however, the additional provision of loans has no significance. The IVQTE model, whilst not designed to provide comparative measurements, does indicate that membership has the greatest benefit in the services sector with significance in all but the 9th decile. Manufacturing is more muted with support restricted to the first 6 deciles against a background of diminishing significance. The second hypothesis that loans improve productivity, enhance EU membership and improves productivity outside the EU is only supported in the latter case. The IVQTE model indicates that loans are significant to the 6th decile within the services sector but only the first two deciles within manufacturing suggesting that there is greater utilisation of loans in the former. However, rental capital (leasing) is significant to the 5th decile which may suggest that firms in both sectors at the lower end of the productivity distribution curve loans are significant with those beyond the median being better capitalised. The third hypothesis that FDI has a positive influence on firm productivity is only tested in the IVQTE model and we find that it has a positive influence in the services sector across all the deciles except for the first. This indicates that FDI has a positive influence throughout the sector apart from the least productive firms. No significance has been found in manufacturing which may reflect the low-tech nature of the Balkan region manufacturing sector proving of no interest to foreign investors (Gabrisch et al 2016). Surprisingly, given the evidence of literature, the fourth hypothesis that exports positively influence productivity has no support in either the manufacturing or services sector. This may echo Gabrisch et al's 2016 findings that exports in the region are a small percentage of GDP.

These results have several policy implications for both member and non-member states. There is little doubt that further enlargement of the EU, to include the Western Balkans, would be a major boost to their economic development and provide a route out of localism rooted in the ethnic and ideological forces within the region. Both membership and loans appear to benefit the least productive firms, except for the service sector where both have universal appeal. There is a need for greater emphasis on the manufacturing sector where rental capital is positively effective amongst the least productive and where enhanced financial intermediation would improve supply and provide capital for technical innovation to improve productivity. Whilst intermittent, the negative influence of replacement capital is

problematical within manufacturing across the distribution and support for an asset replacement programme would appear desirable. The fact that 90% of the sample is SMEs provides clear evidence of where improvements can be achieved amongst the least productive in this sector. The clear success of the service sector in attracting FDI should encourage government to improve the environment for manufacturing and provide a platform to emulate this performance. A programme of modernisation incentives should encourage productivity improvements and lead to an encouraging environment for FDI. The paucity of skilled workers must be addressed and whilst labour costs would appear to be a comparative advantage, income levels may need to be increased to encourage the development of an improved skill base. Equally the issue may be one of management, where the need is to improve the quality and ensure that a more skilled cadre of managers are provided with an appropriate slice of the economic cake (Adalet McGowan and Andrews 2015 p.32). A further conclusion can also be drawn in that the results indicate that the disparity in relation to output per worker is sufficiently constrained as to suggest that, at least at firm level, the rest of the Balkans states are ready to embrace the accession process.

Notwithstanding its contributions, this study suffers from limitations that serve as avenues for further research. Firstly, causality issues may result from any unobservables not identified within the matching model. This may also arise because of the cross-sectional nature of the data. Secondly, because of the limited number of countries studied, the paucity of observations for service sector capital and skilled workers means that the influence of capital on the service sector has been immeasurable. Thirdly, the influence of the control variables across the productivity distribution curve merit further investigation. Finally, it would also allow the creation of longitudinal data to track progress from accession to 2013 and allow a contribution to the question “are the Balkans different?” (Estrin and Uvalic, 2016, p.1). Further research, utilising the BEEPS data over a longer period with the inclusion of 27 Eastern European transitional economies, may allow these omissions to be addressed.

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Table A1. Variable Description.

Variable name	Variable description
<i>Treatment variables in the QTE model</i>	
EU member	DV=1 if a firm operates in an EU member state; zero otherwise.
Loan receipt	DV=1 if a firm received a loan; zero otherwise.
<i>Outcome variable</i>	
Output per worker	Log of output per worker derived by dividing total sales by total full time equivalent employees
<i>Independent variables</i>	
Capital (net assets)	Net asset value in US dollars.
Capital (replacement)	The cost of replacing current capital stock at 2013 values in US dollars.
Capital (rental)	The cost of renting land property and equipment in US dollars.
Export	The percentage of exports to total sales.
Skilled workers	The number of skilled production workers employed.
Cost per workers	The total cost of operations per worker in US dollars.
Foreign owned	Percentage of the firm owned by foreign investors
Firm age	Age of firm derived by subtracting the date of formation from 2013.
Bureaucracy	The average of a Likert scale score (0 - no obstacle to 4 – very severe obstacle) of perceived problems with customs, tax administration, business licencing and labour regulations.
Firm size	Categorical variables =0 if a firm has less than five employees; =1 if a firm has more than four and less than 20 employees; =2 if a firm has between 20 and 99 employees; =4 if a firm has more than 100 employees.
Competition	DV=1 if a firm reported that the number of its competitors was less than 15; zero otherwise.

Table A2. Descriptive statistics for the full sample, manufacturing and service sectors.

Variables	Full sample				Manufacturing sector				Service sector			
	No of obs.	Mean (standard deviation)	Min	Max	No of obs.	Mean (standard deviation)	Min	Max	No of obs.	Mean (standard deviation)	Min	Max
Output per worker	2,433	10.53 (1.32)	3.63	19.86	660	10.36 (1.12)	6.16	13.32	1,596	10.64 (1.39)	3.63	19.86
Capital (net assets)	2,433	7,221.24 (30,447.94)	0	43,333	660	25,592.77 (53178.97)	0	433,333				
Capital (replacement)	2,433	16,284.1 (95,846.51)	0	3,253,219	660	57,919.65 (176,441.6)	0	3,253,219				
Capital (rental)	2,433	207.17 (2,149.33)	0	94,162	660	693.34 (3,984.12)	0	94,161.96				
Export	2,433	0.13 (0.27)	0	1	660	0.26 (0.36)	0	1	1,596	0.07 (0.20)	0	1
Skilled workers	788	0.60 (0.24)	0	1.1	647	0.60 (0.24)	0	1.1				
Cost per workers	2,433	16,913.1 (36,010.42)	0	769,953	660	34,261.48 (56,507.75)	0	769,953.1	1,596	9,937 (19,648)	0	307,910
Foreign owned	2,433	6.82 (23.78)	0	100	660	7.51 (24.55)	0	100	1,596	6.78 (23.84)	0	100
Firm age	2,418	16.83 (13.11)	1	153	659	18.87 (17.12)	1	153	1,583	15.8 (10.32)	1	68
Bureaucracy	2,433	0.56 (0.56)	0	3	660	0.56 (0.55)	0	2.6	1,596	0.57 (0.56)	0	3
Firm size	2,433	1.46 (0.73)	0	3	660	1.62 (0.77)	0	3	1,596	1.38 (0.69)	0	3
Competition	1,966	0.43 (0.49)	0	1	455	0.40 (0.49)	0	1	1,380	0.44 (0.50)	0	1
EU member	2,433	0.34 (0.48)	0	1	660	0.4 (0.49)	0	1	1,596	0.34 (0.47)	0	1
Loan receipt	2,433	0.44 (0.50)	0	1	660	0.52 (0.50)	0	1	1,596	0.42 (0.49)	0	1

Table A3. Estimated treatment and outcome models in the full sample (with treatment level 0 as the base category in the treatment model) (N=786)

Variables	Step 1. Treatment model			Potential -outcome model for treatment =0	Step 2. Outcome model		
	Treatment =1	Treatment =2	Treatment =3		Potential -outcome model for treatment=1	Potential -outcome model for treatment =2	Potential -outcome model for treatment =3
Capital (net assets)	0.000*	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Export	0.820**	0.062	1.310***	-0.351	-0.191	0.005	0.324
	(0.344)	(0.324)	(0.338)	(0.354)	(0.311)	(0.298)	(0.249)
Foreign owned	0.001	-0.012**	-0.009*	0.004	0.001	0.009***	0.006
	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)
Skilled workers	-0.681	-0.867**	-1.020**	-0.743**	-0.734**	-0.732**	-0.688**
	(0.464)	(0.375)	(0.497)	(0.327)	(0.339)	(0.367)	(0.345)
Firm age	0.018**	0.007	0.031***	-0.006	0.006	0.001	0.002
	(0.008)	(0.008)	(0.008)	(0.005)	(0.006)	(0.004)	(0.004)
Bureaucracy	-0.610***	0.235	-0.115	0.240	0.410***	0.012	0.246*
	(0.211)	(0.165)	(0.208)	(0.146)	(0.146)	(0.144)	(0.145)
Firm size	-0.011	0.605***	0.456***	-0.024	0.141	-0.168	-0.036
	(0.171)	(0.145)	(0.165)	(0.112)	(0.120)	(0.105)	(0.120)
Low-tech	-0.630*	0.085	-0.673**	-0.907***	-0.840***	-0.222	-0.523**
	(0.325)	(0.285)	(0.335)	(0.234)	(0.207)	(0.217)	(0.212)
Mid-tech	0.118	0.052	-0.296	-0.447**	-0.447**	-0.065	0.113
	(0.317)	(0.305)	(0.343)	(0.211)	(0.218)	(0.213)	(0.259)
Services	-0.830	-0.338	-0.349	-0.772*	0.377	0.036	1.110***
	(0.706)	(0.563)	(0.644)	(0.404)	(0.429)	(0.482)	(0.308)
Constant	-0.242	-0.929**	-1.354***	10.986***	11.019***	10.994***	10.752***
	(0.459)	(0.405)	(0.467)	(0.332)	(0.288)	(0.354)	(0.320)

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.

Appendix A

Figure A1. Checking the overlap assumption (common region) for the full sample.

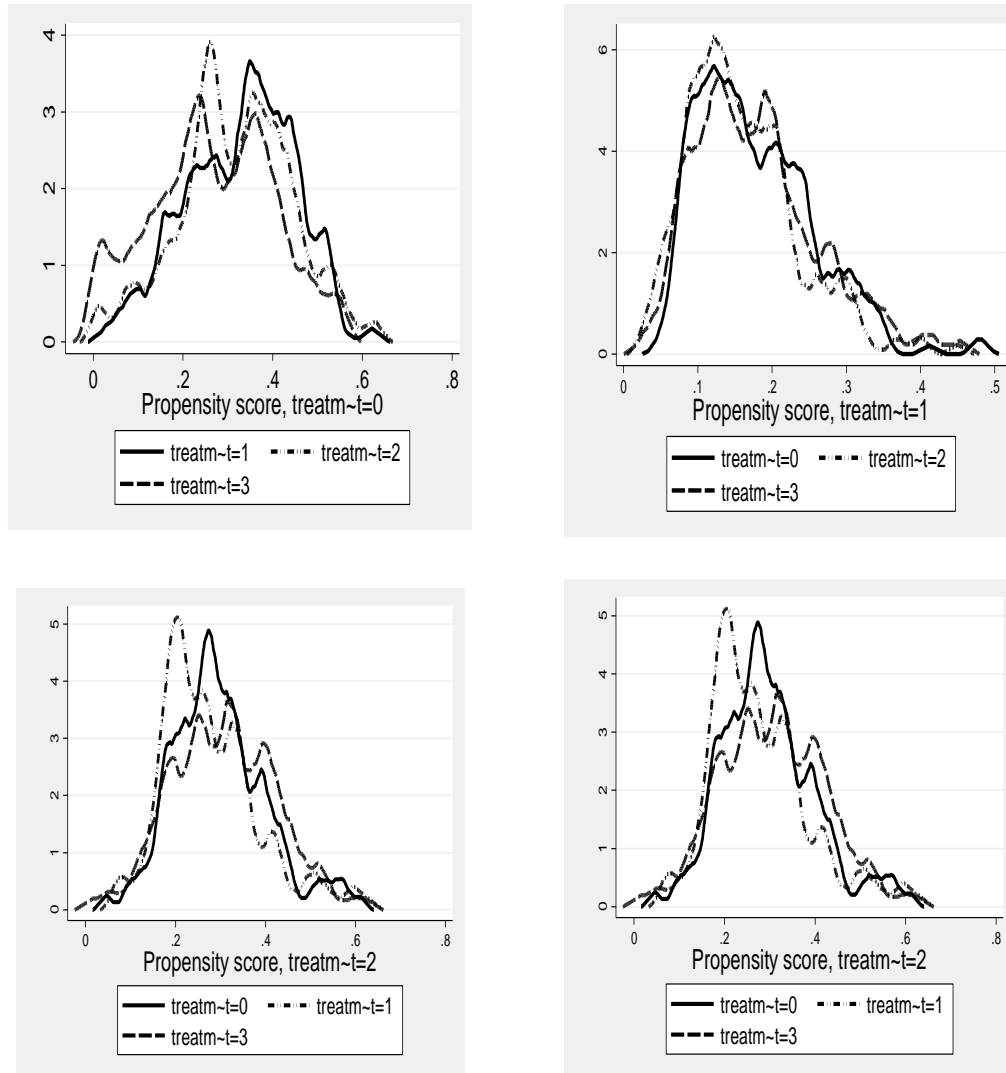


Figure A2. Checking the overlap assumption (common region) for the subsample of firms in the service sector.

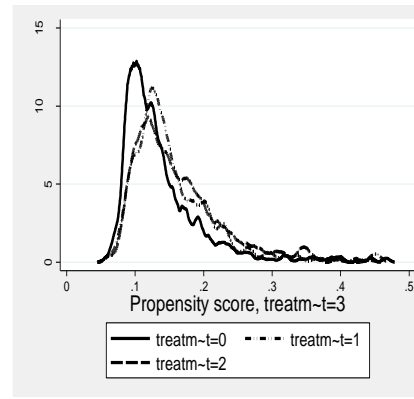
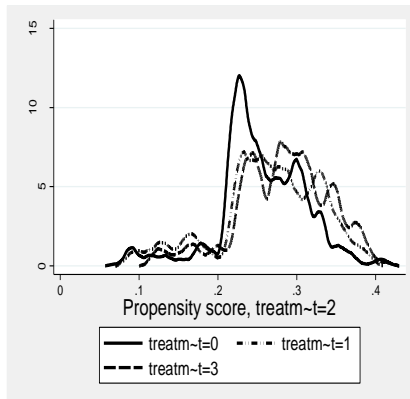
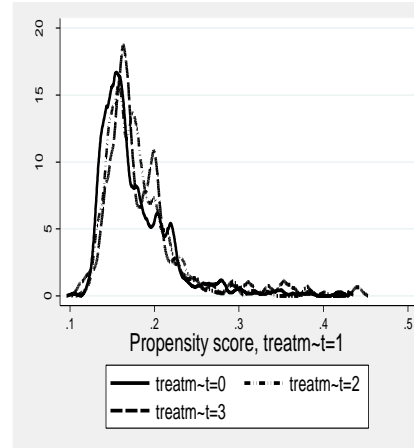
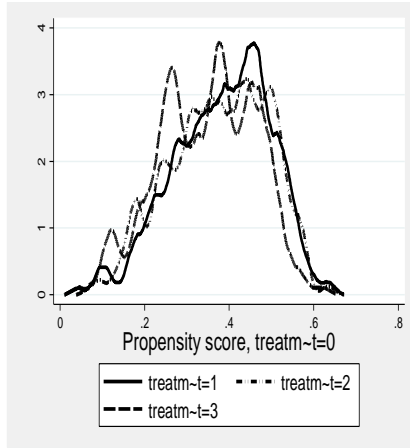


Figure A3. Checking the overlap assumption (common region) in the subsample of firms from the manufacturing sector.

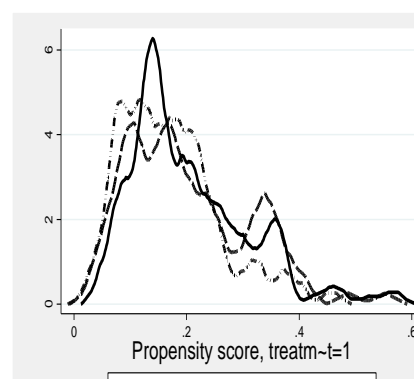
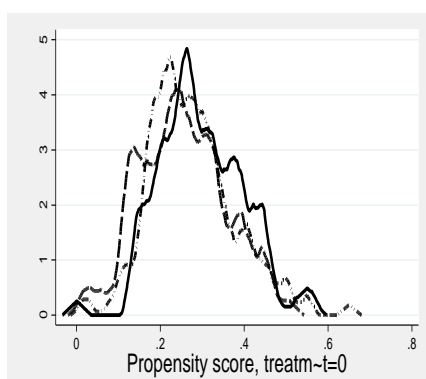
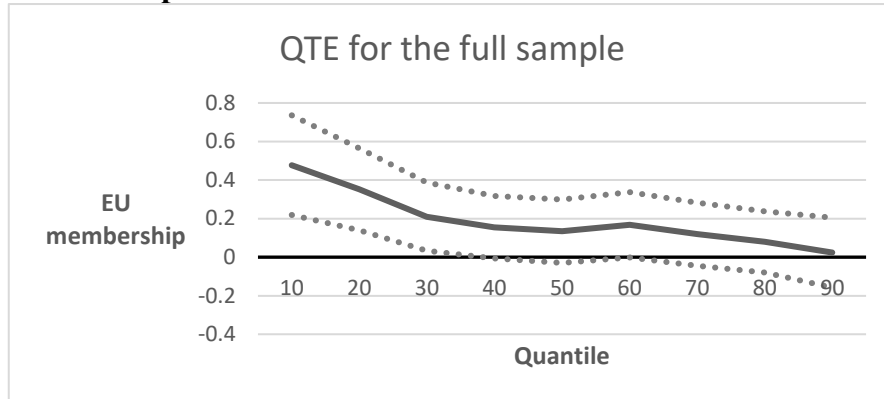
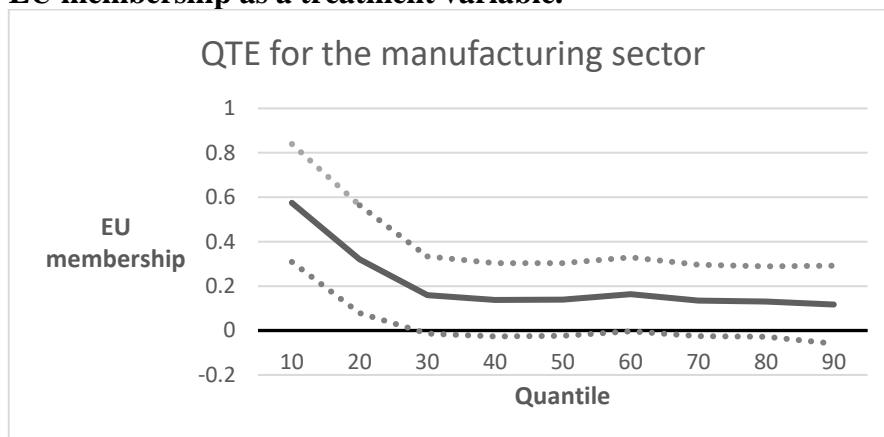


Figure A4. Results from the QTE model for the full sample with EU membership as a treatment variable.



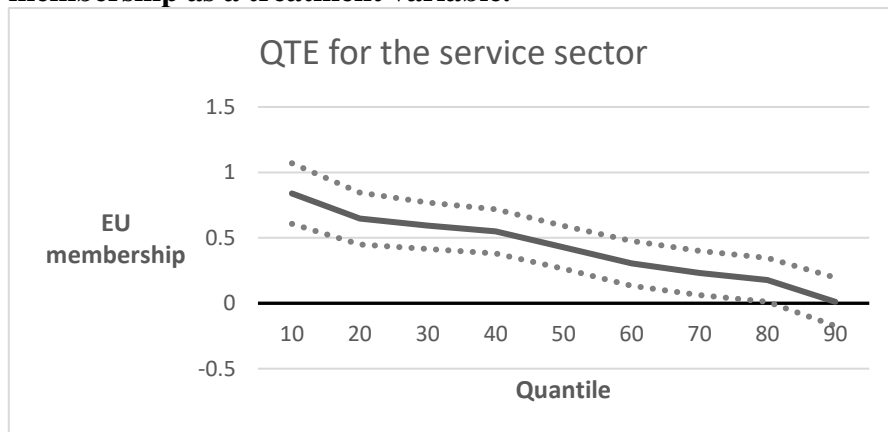
Note: Dotted lines show upper and lower limits of the 95% confidence interval.

Figure A5. Results from the QTE model for the manufacturing sector with EU membership as a treatment variable.



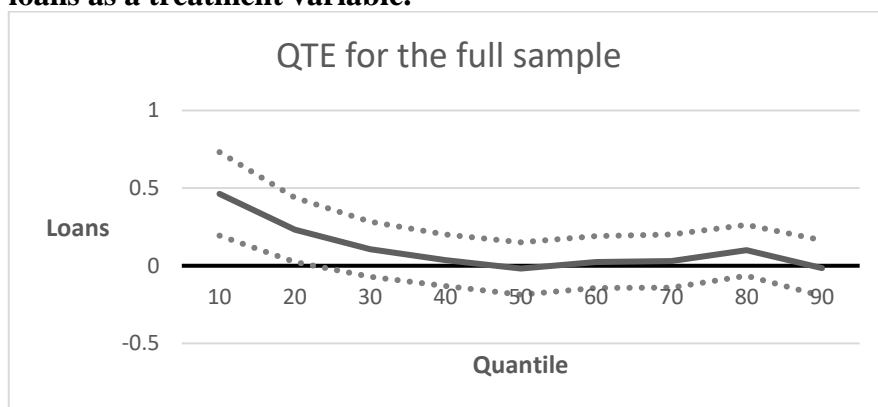
Note: Dotted lines show upper and lower limits of the 95% confidence interval.

Figure A6. Results from the QTE model for the service sector with EU membership as a treatment variable.



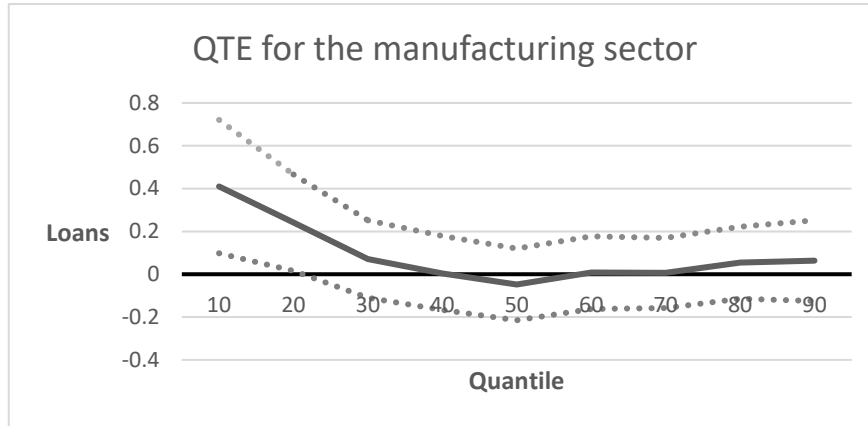
Note: Dotted lines show upper and lower limits of the 95% confidence interval.

Figure A7. Results from the QTE model for the full sample with access to loans as a treatment variable.



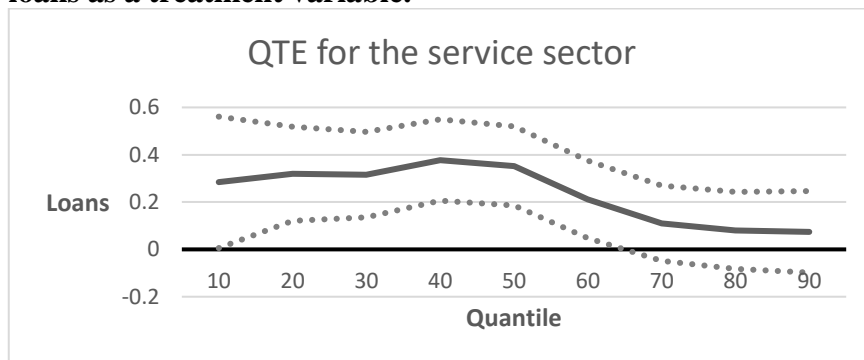
Note: Dotted lines show upper and lower limits of the 95% confidence interval.

Figure A8. Results from the QTE model for the manufacturing sector with access to loans as a treatment variable.



Note: Dotted lines show upper and lower limits of the 95% confidence interval.

Figure A9. Results from the QTE model for the service sector with access to loans as a treatment variable.



Note: Dotted lines show upper and lower limits of the 95% confidence interval.